

What can geolocated sferics tell us about Terrestrial Gamma-ray Flashes?

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The Fermi Gamma-ray Burst Monitor (GBM) has been detecting TGFs with increasing sensitivity over the past two years, owing to changes in flight software that have lowered its threshold for triggering and, recently, allowed a search for TGFs weaker than those which would cause an onboard trigger. Associations between TGFs detected in the first 18 months of operation and sferics detected using the World Wide Lightning Location Network (WWLLN) show that TGF peaks and lightning discharges are simultaneous to within tens of microseconds, and that GBM triggered on TGFs that occurred up to a distance of 300 km from the sub-spacecraft position. In the work presented here, we look for associations between TGFs detected by the Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI) and WWLLN sferics over the same 18 months, and we compare the match rate and detection horizon of the two instruments. We also look for associations between WWLLN sferics and more recent GBM TGFs, both triggered events and weaker TGFs uncovered in our untriggered search. We discuss whether in this new mode, GBM is detecting TGFs that are more distant from the sub-spacecraft point than 300 km, or whether the weaker TGFs are instead indicative of a luminosity distribution, either because the weaker ones originate deeper in the atmosphere or because they are intrinsically dimmer.